Native Fishes of the Lower Colorado River

EVOLUTION, DECLINE, AND MANAGEMENT

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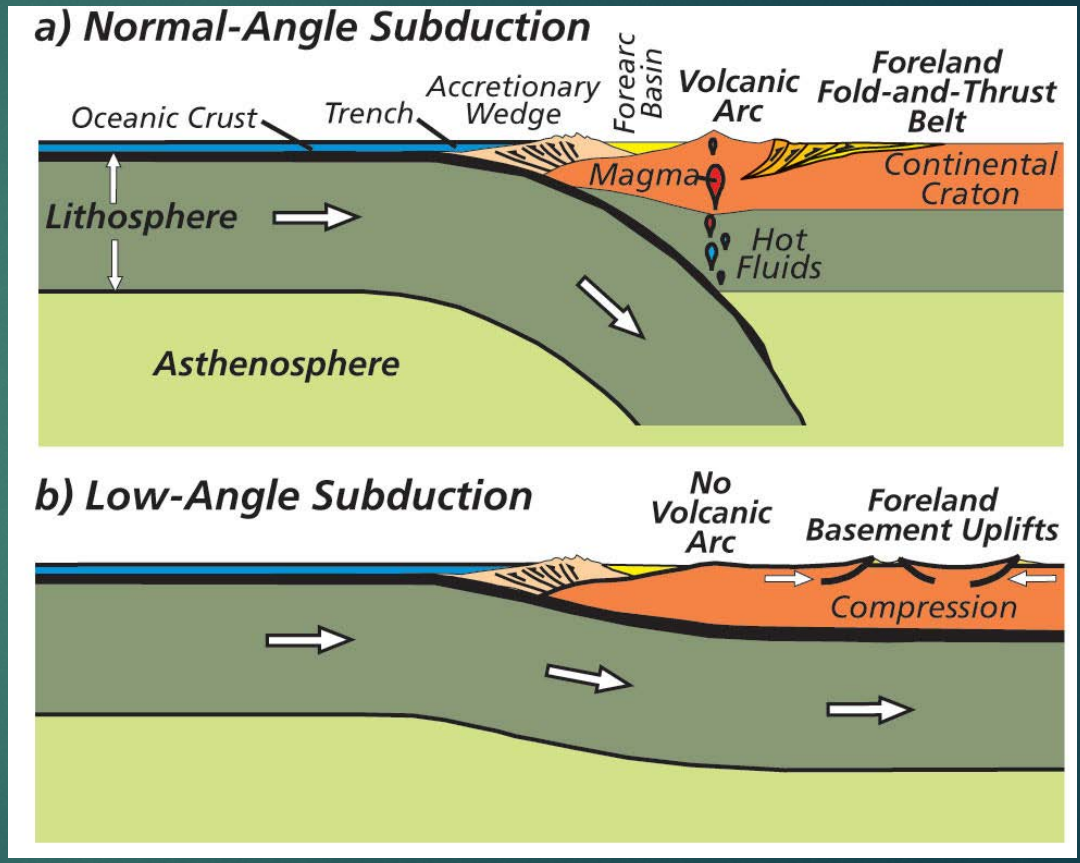
Outline

1. Geologic Isolation of the Colorado River Basin
2. Evolution of native fishes
3. Reasons for decline of native fishes
   - Dams
   - Non-native introductions
4. Management

Isolation of the Colorado River Basin

- Laramide Orogeny (70-40 MYA)
  - Shallow subduction of the Farallon plate under the North American plate caused uplift and compression in the interior of the North American plate (USGS)
    - Forms the Rocky Mountains
  - Cuts the Colorado river basin off from other freshwater systems on the east



https://www.nature.nps.gov/geology/education/images/GRAPHICS/deep_and_shallow_subduction_lillie_2005.jpg

Isolation of the Colorado River Basin

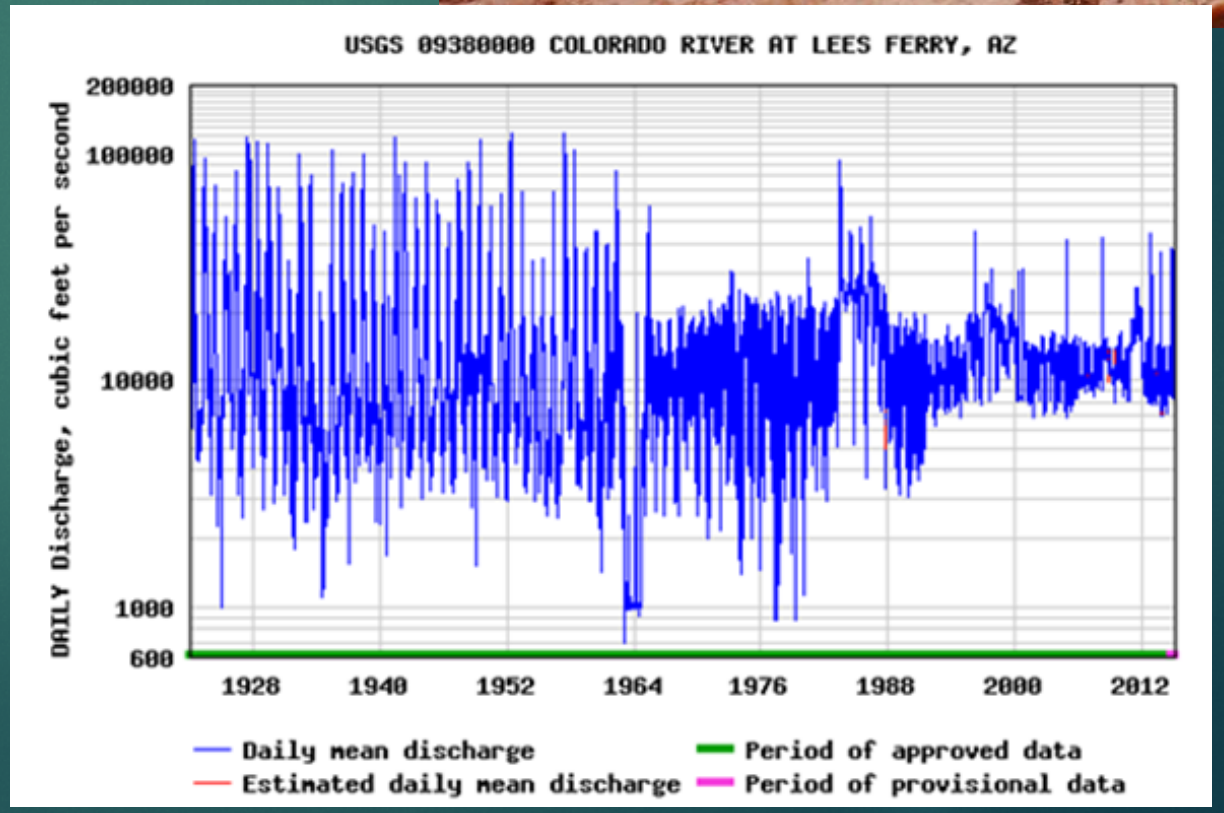
http://enacademic.com/dic.nsf/enwiki/121581

- Basin and Range Formation
  - Crustal extension east to west, cracking along north to south faults and uplifting mountains and down-dropping valleys
    - Erosion of the mountains filled the valleys
  - Result: Western barrier to the Colorado River Basin

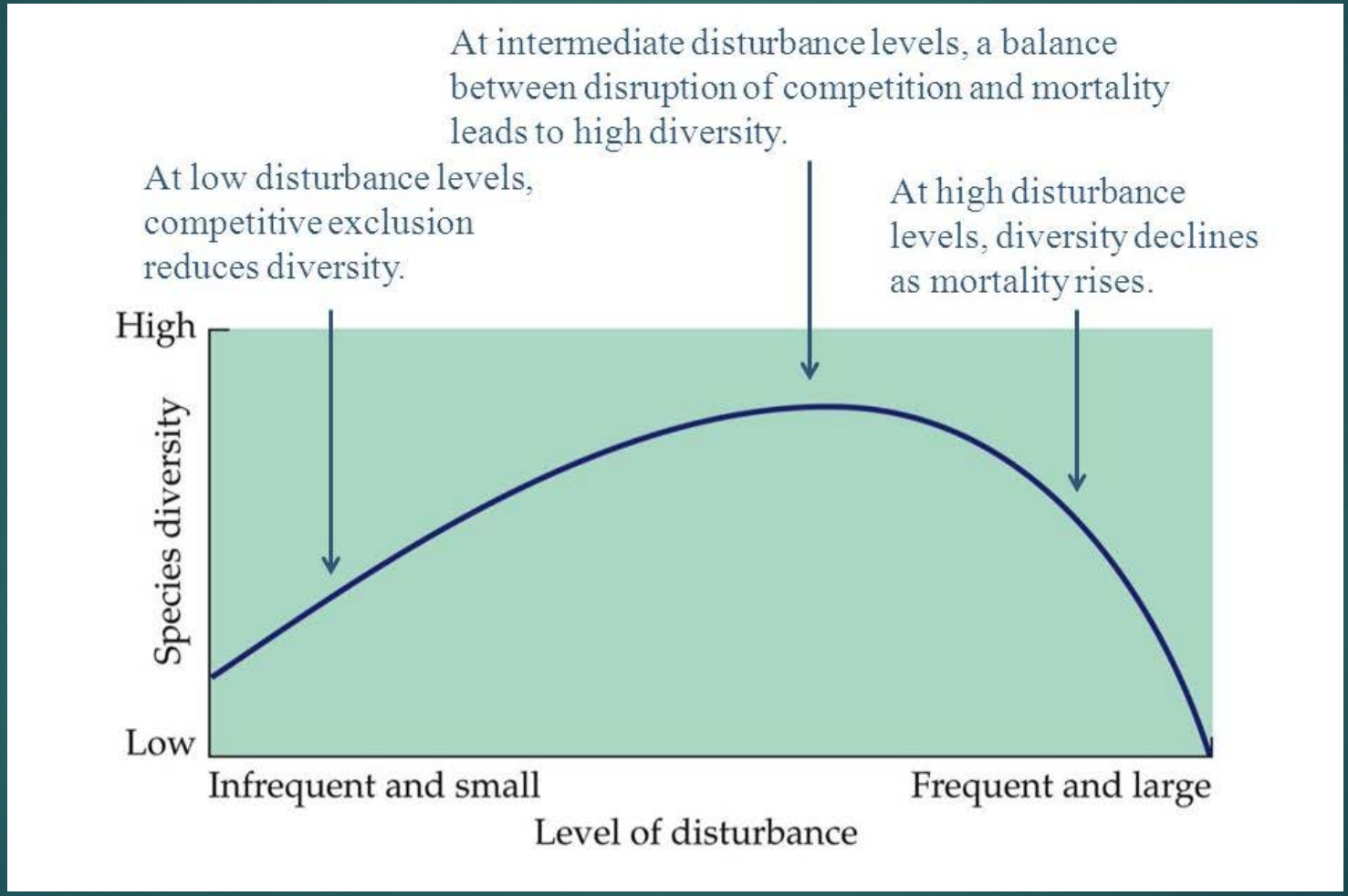
Grose & Smith 1989

Harsh Natural System

- High sediment load
- Variable water temperatures
- Large seasonal flow fluctuations
- **8 highly adapted natives!**

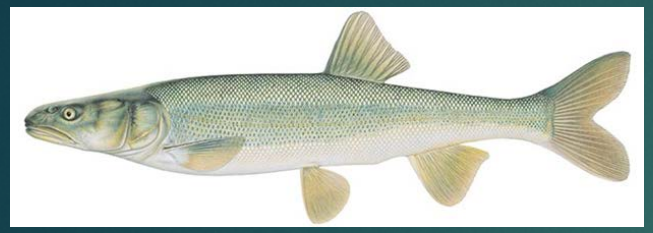


Intermediate Disturbance Hypothesis



https://www.colorado.edu/eeb/courses/2040bowman/EBIO2040/Syllabus_files/022.html

Native Fishes



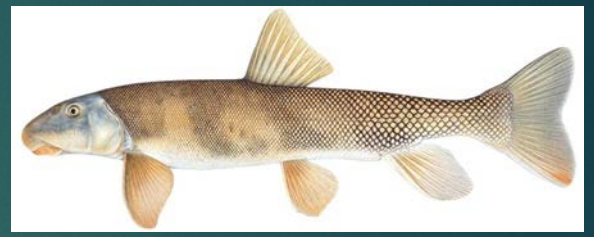
*Colorado pikeminnow (X)

Roundtail chub

*Razorback sucker

*Humpback chub

Speckled dace



*Flannelmouth sucker

*Bonytail (X)

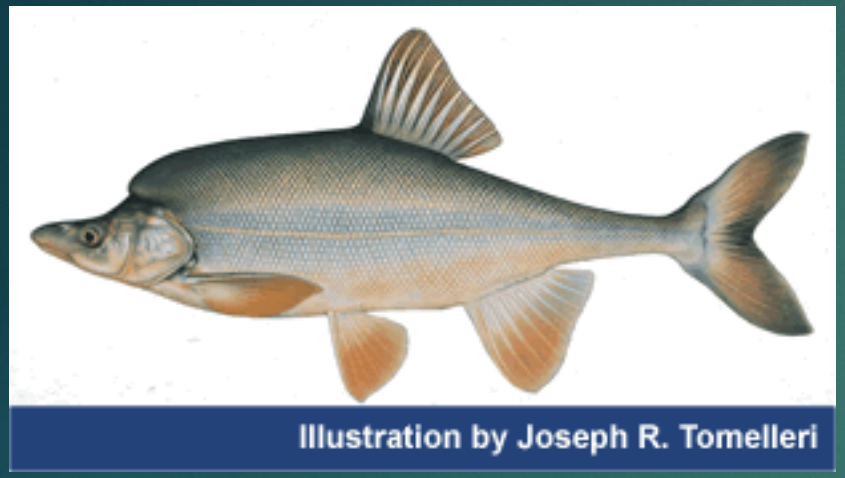
Key

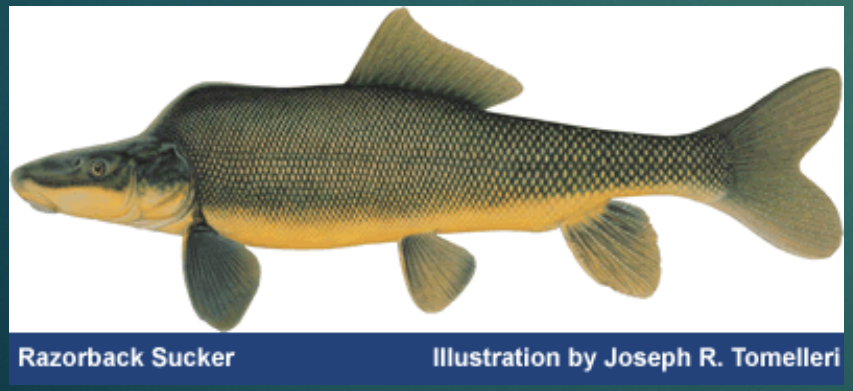
* Endemic to Colorado river
(X) Extinct from lower CO
Endangered
Proposed threatened
Common

*Bluehead sucker

Images by Joseph R. Tomelleri

Morphological Trait: Nuchal Hump





- Present in species of both families
- Originally thought to be a hydrodynamic adaptation (Miller 1946)
- Portz & Tyus (2004) show it is an convergent evolutionary response to predation by the Colorado pikeminnow
  - Pikeminnow is gape-limited piscivore
  - Closely related species (roundtail chub & flannelmouth sucker) live in high velocity without humps

Dams alter the natural flow regime

- High flow floods that scour and transport sediment have been eliminated
- Bottom of the dam releases are cold, eliminating the warm water native fishes need for spawning/rearing
- Clear water releases instead of high turbidity flows

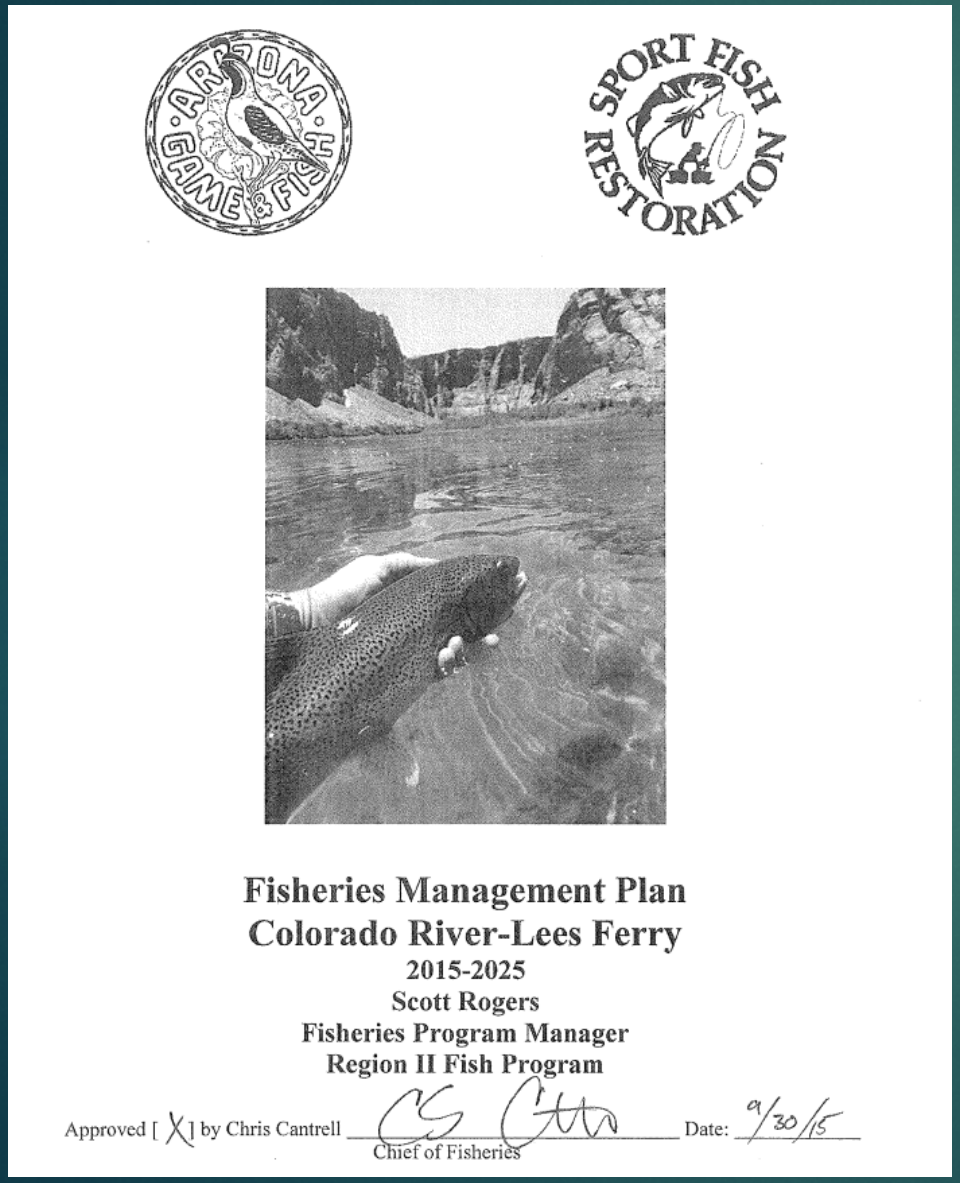
Glen Canyon Dam

Impact of Non-Natives

- Thrive in the new habitat created by dams
- Ecological generalists, competitive, predatory
- Consume native eggs and juveniles

Source: Iowa Department of Natural Resources

Management Difficulties



Fisheries Management Plan
Colorado River-Lees Ferry
2015-2025
Scott Rogers
Fisheries Program Manager
Region II Fish Program

Approved [X] by Chris Cantrell _____ Date: 9/30/15
Chief of Fisheries

- Managing for sportfish (trout) and native fishes at the same time
  - Different habitat requirements
  - Warm, sediment-laden water vs. cold, clear water

Glen Canyon Dam Adaptive Management Program

1. Mechanical removal of non-natives near the Little Colorado River for Humpback chub

2. High Flow Experimental Release
   - Mimic natural flow to cue spawning
   - Increase sediment load downstream
     - Create backwater habitat for native fishes
     - Recreation: rebuild sandbars for rafters

References

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